Collective Bargaining and Unemployment during the Great Recession: Evidence for Spain [*]

Luis Díez Catalán[†]   Ernesto Villanueva [‡]

University of Minnesota   Banco de España

September 2012

Abstract

We study the consequences of (widespread) downward wage rigidity in Spain on job losses during 2009 and 2010, a period with a severe drop in activity. We measure rigidity using the fact that sector-level collective agreements in Spain are automatically extended to all firms in the province industry unit, setting minimum wages that are downwardly rigid during the period of the agreement. Using the exact dates of bargaining periods, we find that agreements bargained in early 2009 adjusted to the large aggregate employment losses by agreeing on wage growth of about 2%, while agreements signed in 2008 settled increases of about 3.5%. Matching information on collective agreements with longitudinal Social Security records on workers, we document three findings. The probability of job loss between 2009-2010 is only weakly higher for workers covered by agreements signed in 2008 than for the rest. Secondly, low-skilled workers covered by agreements signed in 2008 were much more likely to lose their jobs, with elasticities of job loss to wage growth of about 3. Thirdly, once we condition on how binding collective agreement wages were as of 2007, we find effects of date of signature on employment destruction for all skill levels. The degree of wage rigidity generated by the automatic extension of sectorial collective agreements explains around a 36% of the increase in the probability of becoming unemployed for the least skilled.

JEL Codes: J23 - Labor Demand J50 -Collective Bargaining.

[†]luis10catalan@gmail.com

[‡]ernesto.villanueva@bde.es

1 Introduction

The economic crisis started to have a real impact on the Spanish labor market in the fourth quarter of 2008. Since then, there has been a huge destruction of employment by international standards. While the US economy lost 6% of the existing jobs in 2007 in 2009, in Spain, the current employment level is about 14% lower than the 2007 peak[1]. Prior recessions have also exhibited equally large employment losses. There are certainly many factors that may explain such large sensitivity of Spanish employment to GDP fluctuations. Some are structural problems of the Spanish economy such as specialization in construction, high dependence on the banking sector, a disruption in the normal functioning of credit markets or a large share of small firms. Other factors are related to how the labor market is designed such as lack of flexibility, wage rigidity or high lay-off costs.

This study focuses on the role on employment destruction of a form of wage rigidity in the Spanish labor market. Collective agreements at the industry-province level are automatically extended to all firms in the province-industry cell, regardless of the degree of unionization. Automatic extension effectively means that working conditions and, in particular, wage floors bargained at the province-industry level act as compulsory minimum wages in the sector, typically for periods longer than one year.[2] Of course, there are other forms of wage rigidity (for example, see Altonji and Devereux (1999) or De la Roca (2008)), however, wage rigidity associated to automatic extension is specially relevant because it has been subject to considerable political debate as the two last labor reforms (2010 and 2012) had tried to mitigate the impact of automatic extension by making it easier form firms to opt out sectorial agreements. Secondly, macroeconomic models stress wage rigidity due to the staggering of collective agreements as a source of employment fluctuations in the US and in other advanced economies (see Olivei and Tenreyro, 2007, 2010 or Card, 1990, commented below). The particular form of wage rigidity we consider is very close to this theoretical benchmark.

In general, the effect of collective bargaining on wages, and other important vari-

---

[1] http://www.calculatedriskblog.com/2012/02/percent-job-losses-great-recession-and.html

[2] While opting out for a particular agreement is possible in principle, the procedure is rather cumbersome and, in the period considered, depended on the bargaining partners actually accepting the opting out. Recent reforms have been aimed at facilitating the process.

ables such as productivity, profits or the number of hours worked is well documented. However, studies on the impact on employment are less numerous, and knowledge of the effect of collective bargaining on employment remains difficult to obtain (Cahuc and Zylberberg, 2004). For example, Boal and Pencavel (1994) in a framework different from that in my study, document that while unionized workers receive a wage premium, there is not an impact of unions on employment level. Another literature has used legal reforms to union power, arguably exogenous, to study the impact of unionization on transitions to and from unemployment. Blanchflower and Freeman (1994), use the reforms introduced by Thatcher in the UK in the 1980s, which reduced the power of unions, and do not find an impact on unemployment or the probability of exiting from unemployment.

The effect of collective bargaining on employment fluctuations is closely related to its impact on wage rigidity. For example, the impact of a nominal macroeconomic shock on employment and activity depends on how quickly wages adjust. If wages are flexible, they will immediately incorporate the shock thus the level of employment unchanged. However, if wages are rigid, a shock will change the real wage (through the level of prices) altering the level of employment in the economy. In this context, Card (1990) shows that inflation does affect employment levels through imperfect wage adjustment. He exploits differences in the timing of wage settlements in the presence of inflation to identify the impact of wage rigidity in the data. Tenreyro (2007, 2010) illustrates the relevance of wage rigidity on employment fluctuations using macro data an exploiting the "January effect" in the US - nominal shocks should be less effective in January, when wages are typically bargained, than in other periods.

Our study is built on insights from the macro literature, Card, Tenreyro, previously commented, that stresses that wage rigidity is mitigated in periods when collective agreements are bargained. Due to contract staggering, the ability to adjust wages to macroeconomic shocks varies across bargaining units in a given period. We use the late-2008 drop in activity as an unanticipated demand shock. At the time of heavy employment drops, wages in already settled contracts were unable to adjust downward, possibly leading firms to lay-off workers. On the contrary, contracts that were bargained at the time of the beginning of the crisis have the possibility of mitigating nominal wage growth, possibly softening unit labor costs and employment

drops. In sum, automatic extension and the inability of firms to opt out implies substantial cross-sectional variation in the degree of (contract-induced) wage rigidity at the time of the shock. Such variation, provides an unique opportunity to estimate the role of downward wage rigidity on employment destruction during a period of aggregate demand drops.

We use a complete dataset with very detailed information about all the collective agreements signed in Spain. The dataset contains information about the agreed wage increase and on the date of signature, giving us the opportunity to know at each point in time what information the bargaining parties could possibly incorporate into the agreements. We then match the collective bargaining data with longitudinal information data from the Spanish Social Security system to analyze the effects on employment of downward wage rigidity caused by automatic extension of collective contracts.

The results show that the probability of transition from employment to unemployment increases for the workers covered by provincial agreements signed prior to the crisis and the effect is particularly large for the least skilled workers. Further analysis suggest that the effect is the same for all skill groups once we condition on how binding the agreements were. Our results suggest that wage rigidity created by the automatic extension of provincial agreements and multi-period bargaining had an effect on the employment destruction during the 2008-2009 recession in Spain. We also conduct some robustness checks to falsify the identification assumption. Firstly, we condition on industry-region fixed effects that absorb for industry factors that vary across regions - wider geographical units than provinces. We also conduct the analysis for newly hired workers, who are most affected by agreements. The results are robust to those modifications.

Overall, our estimates suggest that the impact of the wage rigidity created by the automatic extension of the provincial collective agreements on employment growth explains around a 36% of the increase in the probability of being unemployed for the individuals in the group with lowest skill. Similar estimates for all levels of skill suggest that transitions into unemployment would have been 5% lower

2 Institutional Background

The Spanish labor market is believed to be very rigid in comparison to international standards (Bentolila and Dolado, 1994). One of the most controversial issues is how collective bargaining works (Bentolila, Izquierdo and Jimeno, 2010). Collective agreements are negotiated between the representatives of employers and workers. The agreements reached in the process are public and legally binding for all workers within the scope of the agreement -independently of whether workers are union members or not. Thus, despite a relatively low rate of union membership (15% or less), collective bargaining coverage in Spain is very high (80%, according to the Ministry of Labor).

Collective contracts in Spain take place at multiple levels. There are basically to types: firm level and sectorial agreements. The former include the ones which only affect the workers in a particular firm. The others are bargained at a given geographical or industry level (national, regional or provincial) and affect all the workers in the given unit which are not covered by a firm agreement (Card and De la Rica, 2006). That is, these are automatically extended to firms in the scope of the agreement regardless of the degree of unionization of the particular firm. The majority of workers are covered by sectorial agreements, particularly, under provincial ones. This level of bargaining represents an intermediate degree of centralization between national - and firm - level agreements (Izquierdo, Moral and Urtasun, 2003). The analysis below focuses on provincial agreements for several reasons. Firstly, more than 50% of the workers covered by collective bargaining are covered by a provincial agreement. Secondly, it is typically argued in theoretical models that the intermediate level of bargaining is suboptimal: national level agreements internalize the impact of wage growth, while firm level agreements are most responsive to particular conditions of the worker and firm (see Calmforms and Driffill, 1988 or Jimeno and Thomas, 2012). In addition, the last two labor reforms in Spain have tried to weaken the automatic extension of provincial agreements.

Therefore, unless a worker is covered by a (more generous) firm-specific agreement, provincial collective agreements establish a (de facto) minimum wage level for 10 skill levels within a particular province and industry. See Appendix A.1. for an example of the construction industry in Navarre. The agreement sets 11 minimum wages for each skill level in the industry. Note that this is a legally binding lower floor that

does not depend on the particular situation of the firm. Moreover, it is very difficult for firms to opt out of the collective agreement [3].

The degree of wage rigidity caused by the automatic extension is exacerbated by the fact that normally collective agreements are set for more than one year. That practice may influence the degree of nominal inertia of the economy, in the sense that if the term of the agreements is long enough, current wages will scarcely respond to changes in demand and, therefore, the variable most significantly affected will be unemployment (Layard, 1991). In addition, longer agreements increase the likelihood of a lack of synchronization (i.e. an overlap) of their signature time, which would also negatively affect wage flexibility.

2.1 Simple model

Consider a simple Cobb-Douglas production function:

$$F(K, L) = Y = AL^{\alpha}K^{1-\alpha} \tag{1}$$

where Y is output, A is technology, K is capital (assume to be fixed) and L is labor. Without loss of generality, we assume competitive markets. The idea is that a firm in a province-industry cell will take the wage level set in an agreement as exogenously given. Therefore, taking the first derivative with respect to L and equalizing it to the real wage, we obtain an expression for the demand of labor:

$$dY/dL = A\alpha(K/L)^{1-\alpha} = \omega/P \tag{2}$$

where ω is the nominal wage and P represents the level of prices, assumed to be fixed.

The whole idea behind this paper can be extracted from this very simple static labor demand equation. Imagine that there is a negative shock that decreases A. In this situation, given our set up framework, there can be two possible scenarios:

I) The nominal wage, ω, is fixed. To restore the equilibrium in the labor market a drop in the labor demand, L, is required.

---

[3]The 2010 labor reform attempted to facilitate the process causing an upheaval among unions. The reason was that attempts to limit automatic extension would erode worker's bargaining power. http://www.elmundo.es/mundodinero/2010/06/14/economia/1276514984.html

II) The nominal wage is flexible [4]. Then, it can partially adjust wages downward. The drop in labor demand would be much smaller than in case I.

If data on nominal wages were available the static equation to be estimated would be:

$$\Delta L = \gamma_0 + \gamma_1 \Delta \omega + a + y + error$$

The linearized equation shows the effect, for a given point in time, that changes in nominal wages have on changes in employment through the slope of the demand equation γ_1. a and y are proxies for the growth of real values of A and Y. However, we only have data on agreed wage increase for collective contracts, that may or may not be binding for a particular firm. Secondly, we do not have data on production or prices at the firm level. Therefore we estimate:

$$\Delta L = \delta_0 + \delta_1 \Delta \widetilde{\omega} + a + y + error$$

Equation (2) measures the impact of collective agreements on employment. a and y are proxies for the growth in real values of A and Y. It would be a "classical" labor demand if collective contracts were perfectly binding for all workers and $\Delta \widetilde{\omega}$ (growth in collective agreement wages) was equal to $\Delta \omega$ (growth in the actual wage). Otherwise, equation (2) can be understood as the average employment response to wage changes for firms where agreements are binding - and the response is derived from their labor demand $\delta_1 = \gamma_1$-and a set of possibly zero responses among firms that pay wages above the collective agreement minimum. We proxy for A and Y using three-digit industry and province dummies.

Note that many omitted variables may obscure the link between changes in collective agreements and employment. Regional or industry-level demand drops may diminish both employment and wage levels. In our context, we exploit the variation on the agreed wage increase for 2009 by date of signature. The main hypothesis of the paper is that, given an unanticipated shock (or a not fully anticipated one), the date of signature of a collective agreement reflects a different information set about macroeconomic conditions by bargaining parties but that, conditional on our proxies

---

[4]We assume that there is some nominal rigidities and the wage is not fully flexible, otherwise the whole adjustment would be through prices

of A and Y, they do not reveal systematic information about the firm's performance. The degree of rigidity induced by automatic extension and multi-period bargaining implies that only collective contracts signed after the shock may partially adjust to the new economic situation setting wages downward. However, collective agreements already signed before the shock cannot adjust. Therefore, firms covered under these contracts had a binding collective agreement, a "legal fixed minimum wage level" and they could not adjust wages to the new situation. If wages are fixed, the adjustment to aggregate shocks must happen through quantities. As a result, the probability of transitions from employment to unemployment in the firms covered by agreements already fixed at the time of the shock would be higher.

3 Data

We use two datasets: the *Registro de Convenios y Acuerdos Colectivos* (Census of Collective Agreements) and the *Muestra Continua de Vidas Laborales* 2010 - MCVL (Continuous Sample of Working Histories, CSWH 2010). The Census of Collective Bargaining includes all agreements signed in Spain, that must be registered in the Ministry of Labor. The dataset contains detailed information about the main characteristics of the bargain. For example, there is information on the agreed wage increase (the wage that the union and the employers agreed ex-ante, before any ex-post correction due to inflation). It also contains information about the 2-digit industry, an unions' estimation of the number of workers covered by the agreement, the type of agreement (sectorial or firm level), etc. Particularly important for the purpose of the study, the dataset contains information on the day in which the agreement was signed and bargaining ended. Then, it is possible to use the exact day when the contract was arranged to establish what information could possibly be incorporated in the agreement. The Census contains limited information about the level of the wage set in the agreement for each skill level.

On the other hand, *The Continuous Sample of Working Histories* 2010 is a micro-level dataset built upon Spanish administrative records. It contains electronically recorded information for approximately 1.1 million individuals who at any time during 2010 had an active record with the Spanish Social Security system. The CSWH also has a longitudinal design. From 2005 to 2010, an individual who is present in a wave

and subsequently remains registered with the social security administration stays as a sample member. In addition, the sample is refreshed with new sample members so it remains representative of the population in each wave (Bonhomme and Hospido, 2012).

The CSWH contains some information that permits constructing the skill level of a worker. Namely, each worker in Spain is assigned a skill level (from a table of 11 levels). The first two levels are reserved in principle to workers with college. The following levels 3-9 are defined by hierarchy at the job, while the latter two groups correspond to laborers, unskilled workers.

3.1   Linking both Datasets

To assess how the rigidity created by the automatic extension of the provincial collective agreements affects the probability of losing the job during the recession, we merged both datasets. The matching has been done using information on the 3-digit industry of economic activity and information on the province where the individual was working. We have assigned a collective agreement to each of the 3digit industry-province cell in the CSWH using the name of the collective agreement. As explained above, we use provincial collective agreements only, assuming that those agreements are the ones binding for each of the individuals in a given cell industry-province. In some cases when there are several provincial agreements in a given industry, we have assigned to all the individuals in that particular cell the agreement that covered a higher number of workers. Using only provincial collective contracts has a cost. We consider neither national or region-level agreements -covering around 35% of workers and most common in the financial services industry. Regional and nation-level agreements have above-average importance in industries such as manufacturing, business services and other services. We are not considering firm level contracts either - which cover around 11% of the workers and most prevalent in the energy, extractive and transport industries, see Izquierdo, Moral and Urtasun, 2003.

It is unclear what the focus on provincial agreements implies for the analysis.[5],[6]

---

[5]While there are 52 provinces in Spain, there are only 17 regions. Not all the regions have their own agreement

[6]Data on the percentage of workers by different types of collective agreements can be found in Bentolila, Izquierdo and Jimeno

Due to the particular way agreements are bargained, provincial agreements typically improve the working conditions of nation- or region-level ones. In that sense, province-level agreements would be the most relevant. As for firm-level agreements, its omission implies that much of the variation we exploit is driven by smaller firms, that cannot afford to have their own agreement. For the particular purpose of this paper, we have only used collective agreements with economic effect in 2009 and that were signed between January 1st, 2008 and December 31st 2009. The reason for excluding the agreements signed before 2008 is the fact that using a starting date before January 2008 it would introduce fairly restrictive selection criteria. Being employed in an industry at time t may be affected by the agreed wage increase signed before moment t. Hence, studying the impact of a wage increase in the first quarter of 2007 would require to analyze workers who were already working in late 2006. With a third of the working force being hired with fixed-term contracts, that selection would bias the sample toward stable workers. We also exclude agreements that had not been signed by the end of 2009. Firstly, those agreements are likely to be special, in the sense that they are likely to be affected by particularly bad shocks that froze bargaining. Secondly, it is argued that at the time there was strategic behavior played by the bargaining parties due to anticipated legislative changes that was being negotiated (the 2010 Labor Reform). More than a half of the contracts were not renewed in 2010.

3.2   Final dataset

First, we consider only men, but use a sample of females in a robustness check. Secondly, we examine cohorts born between 1950 and 1991 who have been employed during 2008 (at least 1 year). The resulting sample includes 46,291 observations, which individual contributing one observation. 18% of workers in the sample are high-skilled (meaning that belong to the groups 1, 2 or 3 of the Spanish Social Security System), 23% are medium skilled (meaning that belong to the groups 3, 4, 5 or 7) and 59% is low skilled (meaning that belong to the groups 8, 9, or 10). On the other hand, the vast majority of workers in the sample (87%) is covered by an open-ended individual contract. The mean of the agreed wage increase for the collective contracts signed in 2008 with economic effect in 2009 is 294 basis points. However,

the agreements signed in 2009 have a mean of 125 bp. The difference suggests a substantial downward adjustment of wages in 2009. Table 1 provides some summary statistics

3.3 Subsample with information on collective agreement wage levels

Unfortunately, wage levels are not available in the collective contracts dataset. For the period spanning 1994-2001, the basic wage level by skill level was available for some industries. Using the revised agreed wage growth (the ex-post agreed wage increase corrected by inflation) from 2002 to 2008 we have computed the collective wage levels in 2008 in five industries: Construction, Metal, Retail Trade, Accommodation and Food Service and Other Services. In all cases, the wage level is available for seven groups of the Spanish Social Security System: 1, 2, 3 (High Skilled), 4, 5, 6 (Medium Skilled) and 10 (Low Skilled) (see Lacuesta, Puente and Villanueva, 2012). By using this dataset we can take into account how binding collective agreements are and for what groups. The characteristics of the resulting sample are presented in Table 2. In addition, we also present results in a sample of newly hired workers, as the wages of these workers are closest to the base wage that we have computed. The summary statistics are presented in Table 3.

Figure 3 casts some light on the set of workers most affected by collective agreements. In particular, it presents the distribution of nominal wages for the construction sector in Madrid for three groups: low (group 10), medium (group 5) and high (group 10) skilled. To alleviate biases due to the lack of information on wage complements due to tenure, Figure 3 focuses on the newly hired. Each of the graphs includes a line that represents the basis collective agreement wage level for specific skill level -computed as explained above. Figure 3 suggests that the level of the wages set in collective contracts are binding for the low skilled workers but becomes much less important as the level of skill increases.

11

4 Empirical strategy

We estimate the models of transition from employment to unemployment as a function of the exact date when the collective provincial agreements was signed. As shown in the descriptives of the full sample, wages vary as new information arrives and the date of signature matters. Therefore, similar workers in 2009 are subject to a different agreed wage increases depending on whether their collective contract was signed early in 2008 (when the full extent of employment destruction was still unpredicted) than in 2009 -when unions and firms could observe and bargain taking into account national net employment losses of about 8%. The parameter of interest can therefore be interpreted as the slope of a province-industry level "demand curve": a higher bargained wage increase should increase the probability of becoming unemployed in 2009.

In our setting, demand shocks that affect both employment and wages are to be expected: construction experienced a severe drop in 2008, and that drop is likely to propagate to industries that provide inputs for the sector. In the presence of industry-specific demand shocks, an OLS specification linking transitions into unemployment to observed wage increases would be biased. Hence, we instrument the agreed wage increase using the date when the contract was signed. We use linear probability models. We estimate models of the following form:

$$Y_{s,p} = \alpha_0 + \alpha_1 1(signed\_2008_{s,p}) + X_{sp} + \gamma_s + \pi_p + \varepsilon_{s,p}$$

Where $Y_{s,p}$ denotes the outcome of interest -bargained wage increase in the first stage, $\Delta W_{sp}(2009)$ and probability of transiting from employment into unemployment in the intention-to-treat specification: $P[U_{sp}(2009) = 1|E_{sp}(2008) = 1]$. X_{sp} collects individual characteristics such as type of contract (whether is open-ended or fixed-term contract), age dummies, nine dummies denoting the skill level (proxied by the group of the Spanish Social Security system) and collective agreement characteristics such as the length of the contract, whether is the first collective agreement or not and whether it contains an escalation clause -a provision that the agreement will be revised if at the end of the year inflation exceeds a given minimum. All specifications include 3-digit level fixed effects -as this is the level at which we assign the collective agreement, and 49 provincial dummies. Those fixed effects will absorb industry- and

province -specific shocks to wages and employment.

The main variable is $1(signed\_2008_{s,p})$, an indicator of whether or not the contract was signed in 2008. Given the discussion about the degree of anticipation of the magnitude of employment destruction in the last quarter of 2008 and the first of 2009, we expect that the coefficient of $1(signed\_2008_{s,p})$ would be positive in the first-stage -agreements before the drop in employment should have settled higher wage increases than those settled in the early months of 2009. Similarly, in the employment equation, firms covered by agreements settled in 2008 would have experienced much larger wage costs, leading to employment reductions -a higher probability of transiting into unemployment.

The first stage equation basically compares compare wage growth in two different bargaining units in the same industry. To illustrate the source of identification, one may think of a comparison between the accommodation and food service collective agreement of Navarre with the same collective agreement in Valladolid. The one in Navarre was signed in the second quarter of 2008 and had an agreed wage increase for 2009 of 300 basis points, whereas the agreement in Valladolid was signed in 2009 and had an agreed wage increase of 140 basis points. Hence, a restaurant in Navarre would face the 2009 recession with higher wage growth than another one in Valladolid. If labor costs play a role in dismissal decisions, we would expect larger reductions in employment in the Navarre restaurant.

Our identifying assumption is that changes in wages agreed in the second case are due to more information about the amount of employment destruction during the 2008-2009 crisis and do not reflect industry-province specific effects which are correlated with the date of signature. To control for those, we also conduct some robustness checks to support the identification assumption. Firstly, we condition on industry-region effects that absorb for industry factors that vary across regions - wider geographical units than provinces. We also conduct the analysis using a sample of newly hired workers for whom we could assign the wage level in the agreement. In that specification, we examine if contracts signed in 2008 led to higher employment destruction among workers who are closest to the minimum wage level set in the agreement.

5 Results

When did collective bargaining observe the crisis? Answer this question is crucial for the purposes of the study. Depending on when a collective agreement is signed there is going to be a different set of information. At the time, information about employment destruction was mixed and there was uncertainty about how temporary employment destruction was. According to the Spanish version of the Current Population Survey (EPA, by its Spanish initials), the largest employment drops occurred in the fourth quarter of 2008 and in the first quarter of 2009 - see Figure 2. However, they could only be observed later in the subsequent quarter (EPA 10 2008q4 was only released around February 2009, and EPA 2009q1 around late April 2009). Wages would arguably respond to cumulated employment destruction in the fourth quarter of 2008 and especially in the first quarter of 2009 in negotiations starting around April 2009.

To study the issue we track the evolution of the "agreed wage increase" of all the collective agreements with economic effect in 2009 by year and quarter of signature. Figures 4 and 5 suggest that wage moderation to the intense employment destruction in 2008q4 happened mainly in 2009. Namely, Figure 4 shows basically no trend in wage growth for agreements signed in either 2006, 2007 or 2008, but a considerable wage drop in 2009 -these are all agreements setting the wage for 2009. The estimated difference in the graph is around 80 basis points. Figure 5 shows the quarter time pattern evolution of the "agreed wage increase" for the contracts signed in 2008 and 2009. The figure gives some evidence of slowing wage growth already in the last quarter of 2008 (especially in November and December). However, once again, the main adjustment comes in 2009.

To preview our results, Figure 6 shows the average probability of transition from employment to unemployment in 2009 for each quarter of signature of the collective contract between 2008q1 and 2009q4. The probability of becoming unemployed was 2 % higher for collective contracts signed before 2009 than for contracts signed in 2009. In the second panel, we focus on a subsample of laborers, or very low-skilled workers. The second panel shows a 5% difference in the probability of transiting into unemployment depending on whether the contract was signed before 2009 (and the agreed wage increase was around 3%) or after (and the associated wage increase was below 2%). As Figure 3 suggests that collective agreement wages are most binding

14

for low-skilled workers, an interpretation of Figure 5 is that higher wage growth in collective agreements affects most the employment losses of the set of workers whose wages were closest to the industry minimum.

5.1 Intention-to-treat estimates

Table 4 regresses statutory wage growth in collective agreements on dates of signature. The dataset used is the Census of Collective agreements, and each agreement contributes one observation. We weight each observation by the number of workers that unions estimate that are covered by the agreement. The coefficients in the Table suggest a drop between 80 and 130 basis points in wage growth in agreements signed in 2009 or 2010, controlling for 3-digit industry fixed effects, province dummies and agreement characteristics.

Table 5 presents a series of OLS regressions linking the probability of transiting from employment in 2008 to unemployment in 2009 to the date of signature. We use a sample of males and examine the response of job loss of females in a robustness check below. The first specification (first four columns) control for industry- and province-fixed effects, while.the second one includes a control for interactions of regional-industry effects. For each specification, we present two measures of transitions from employment to unemployment. 2009 measures the probability of job loss during 2009 for a person employed in the first quarter of 2008. Job loss is defined as the event "having three months or more of unemployment during 2009". We interpret that specification as measuring a "short-run" effect of wage increases. The heading 2009-2010 is defined as the event "staying six months or more in unemployment between 2009 and 2010". We interpret this alternative specification as a "longer-run" effect. The idea is that the timing of a layoff due to a high wage increase in 2009 is indeterminate, so if layoffs happen late in the year, we would only observe a substantial unemployment spell in 2010.[7]

Columns (1-2) present the effects for the full sample. The estimate in the first

---

[7]Furthermore, we also show some of the controls included in the main regression, as they give an idea of the correlates of job loss during the recession. Both younger and close to retirement workers had a higher probability of transition into unemployment during the recession than prime-age workers. The probability of becoing unemployed decreases with the level of skill and, not surprisingly, the incidence of job loss is much higher among workers covered in 2008 by a fixed-term contract -contracts with very low firing costs.

row and first column of Table 5 shows that the impact on the probability of being unemployed in 2009 of the event "the collective agreement was signed in 2008". The standard error is corrected for heteroskedasticity and arbitrary correlation at the province-industry level. The point estimate in the first row, first column is suggesting that workers covered by an agreement signed in 2008 were on average more likely to lose their job. In the second column we show the response of unemployment in 2009 and 2010, that is 0.973%, but it is somewhat imprecisely estimated and it is only marginally statistically significant from zero. The coefficient implies a 1% higher probability of transition from employment to unemployment among contracts signed in 2008. Columns (3-4) in Table 5 present the effect for the least skilled group of workers in my sample. As we argued above, this is also the group for whom bargained wages are closest to actual wages. The coefficients in the first row, third and fourth columns, are 3.17% and 3.18%, positive and statistically significant from zero at the 95% confidence level. The coefficient is also higher than in the overall sample (3% in the least skilled sample, as opposed to 0.973% in the full sample). It is worth noting that when we examine the least skilled group, the magnitude of the impact is similar in the long and short run.

Columns (5-8) control for regional-industry fixed effects. Region-industry level control for region-industry trends that could be correlated with the year of signature. Columns (5-6) present the results for the full sample. The point estimates remain positive (at least for the 2009-2010 specification) with a point estimate of "contract signed in 2008" of 0.863%. Nevertheless, the coefficients are very imprecisely estimated. Columns (7-8) of Table 5 show the effect of year of signature on employment loss for the group 10. Once we control for region-industry fixed effects, the coefficients for the low-skilled workers are even larger than in the baseline specification that did not interact region and industry (6% for the probability of losing the job in 2009 and 2010 vs 3% in a model that did not include region fixed-effect).Overall, these results confirm that higher bargained wage increases increased transitions into unemployment among low-skilled workers mainly. In particular, the estimated coefficient of "contract signed in 2008" is, as in columns (3-4), positive and statistically different from zero at the 90% confidence level (for 2009) and 95% (for 2009-2010).

In order to assess the magnitude of the impact we now turn to an IV approach.

15

5.2   IV regression

We now present IV regressions of the probability of transition from employment to unemployment on agreed wage increase using as instrument the date of signature. This specification assumes that the arrival of new information was most relevant throughout 2009. Therefore, we do not use the quarter time pattern as an instrument (results were weaker when we did so). This may be an issue because, as stated above, there is some evidence of slowing wage growth already in the last quarter of 2008 (especially in November and December). Still, there are reasons to use 2009 as the period of adjustment. The destruction of employment was observed around Feb2009 and the bulk of the adjustment (150 basis points wage drop relative to 60 basis points) happened in the latter two quarters of 2009.

Tables 6A and 6B presents IV results of the impact of wage growth on employment growth for the full sample. The first specification (first five columns) control for industry and province fixed effects. The second specification (last five columns) include an additional control for interactions of regional industry effects. Column 1 of Table 6A shows the impact of date of signature on agreed wage increase (the first stage). It is 1.311, which means that the predicted value of the agreed wage increase of the collective agreements signed in 2008 is 1.311% points higher than the ones signed in 2009. Columns (2-3) of Table 3 show the intention-to-treat estimates for both the "short run" and the "long run" specification. Finally, the Instrumental Variable estimate of the impact of wage growth on employment growth for the full sample is also positive and in the "long-run" specification, but only marginally significant. The magnitude of the IV estimate is 0.00742 and implies that a 1% increment in the "agreed wage increase" increases the probability of transition from employment to unemployment by 0.742% -an elasticity of employment destruction to wage increases of about 0.7. Columns (6-10) of Table 6B present similar results but including the interaction of regional-industry dummies. In the Instrumental Variable regression, the point estimates continue being positive just for the 2009-2010 specification (column 10 of Table 6B).

Tables 7A and 7B present Instrumental Variable estimates of the impact of wage growth on employment growth for the least skilled group. Again, the first specification (first five columns) control for industry and province fixed effects. The second

specification (last five columns) include additional controls for interactions of region-industry fixed effects.

Notice here that the coefficient of the intention to treat estimate of date of signature on employment destruction in the first row, columns (2-3) in Table 7A is much higher when we control for regional-industry fixed effects. In particular, the probability of transition from employment to unemployment if the collective agreement is signed in 2008 increases from 3.18% to 5.74% (for the specification that examines unemployment spells during 2009 and 2010).

The least skilled, Columns (4-5) of Table 7A and (9-10) of Table 7B present the IV coefficients of the estimate of wage growth on transitions into unemployment for the sample of least skilled workers. All coefficients are much higher than the comparable estimates in the full sample. A 1% increment in the "agreed wage increase" increases the probability of transiting from employment to unemployment by 2.59% both in the "short" and in the "long" run. Including regional-industry fixed effects increases the value of the coefficients. In particular, a 1% increment in the "agreed wage increase" increases the probability of transition from employment to unemployment of a worker in group 10 by 5.16% (marginally significant coefficient) in the "short run". The effect in the "long run" is higher, 6.02% and statistically significant at the 90% confidence level.

What is the economic magnitude of these effects? We use a back of the envelope computation to determine the impact of the wage rigidity created by the automatic extension of the provincial collective agreements on employment growth. Namely, if we assume that the wage growth of worker covered by an agreement signed in 2008 was the average increase of an agreement in 2009, the probability of transiting into unemployment is 0.28. This number compares to the 0.332 average probability of transition into unemployment in 2008. Hence, the higher wage increase of agreements in 2008 explains around a 15% of the increase in the probability of being unemployed for the individuals in the group with lowest skill. Similar estimates for the full sample suggests that had the collective agreements signed a wage increase in 2008 similar to that in 2009, transitions into unemployment in the full sample would have been 6% lower.

If we use the specification that controls for the interaction of regional-industry dummies, we predict a much larger effect. In this case, the higher wage increase of

agreements in 2008 explains around a 36% of the increase in the probability of being unemployed for the individuals in the group with lowest skill. Similar estimates for the full sample suggest that transitions into unemployment in the full sample would have been 5% lower.

5.3 How important is whether a collective agreement is binding or not?

Previous results have ignored how binding collective contracts are. Nevertheless, collective contracts really specify wage floors, not necessarily wage growth. Hence, only the wages of workers whose wage level is already close to the floor set by the agreement are likely to be affected by higher wage growth. The results, so far, suggest that the effect is mainly relevant for least skilled workers. Therefore, the impact of wage growth on transitions to unemployment may reflect either (a) a differential impact by skill level or (b) a differential impact due to proximity to the wage level. Disentangling between both hypothesis is important to understand through which specific channels, if any, is wage rigidity causing employment losses.

We use a subsample with information on nominal collective agreement wage levels to test if, within the subsample of agreements signed in 2008, those workers with wages closer to collective agreement wages experienced a higher probability of experiencing unemployment in either 2008 and 2009. The subsample was constructed by Lacuesta et al. (2012) and contains information for five industries (Construction, Metal, Retail, Trade, Accommodation and Food Service and Other Services to Businesses) and seven groups of the Spanish Social Security System: 1, 2, 3 (High Skilled), 4, 5, 6 (Medium Skilled) and 10 (Low Skilled).

As in the previous case, the resulting sample only includes men and it has a very similar average agreed wage increase, average age and proportion of fixed-term contracts. However, there is a clear underrepresentation of low-skilled workers in comparison to the main sample (a proportion of only 27% in comparison with a 60% in the main sample). Table 2 of the Appendix, summarizes this information by year of signature.

To assess the relevance of proximity to the collective agreement basic wage limits, we measure for each worker the distance between the wage in 2007 and the floor set

in the sectorial agreement for his or her skill-province-industry level $\overline{W}_{sp}$. Namely,

$$Binding = W_i(2007) - \overline{W}_{sp}(2007)$$

Agreements signed in 2008 resulted in higher wage growth, so we expect that the interaction between signing a contract in 2008 (before the full extent of employment destruction was publicly known) and the "binding" variable is a strong (negative) determinant of employment destruction. In other words, employment destruction should have been most severe in industries signing agreements early *and* where workers earned wages close to the minimum agreed wage in the 2007 collective agreement.

Table 8 presents the results of the specification (1) where we control for industry and province dummies. Columns (1-2) show the effect of date of signature on the probability of transiting from employment to unemployment for both 2009 and 2009-2010 specifications. Notice that results using this sample differ somewhat from those using the main one. For example, the effect of the year of signature on the probability of job loss is 0.024 (0.0043) -first row, first column of Table 5- in the "short run" specification and 0.039 (0.0097) in the first row, second column of Table 5 when transitions in 2010 are included in the definition. For the sample, the effect of date of signature is higher and statistically significant (before it was only marginally significant).

Columns (3-6) of Table 8 introduce two different specifications. The columns 3-4 of Table 8 introduce "$Binding$" as a continuous variable and its interaction with an indicator of "contract signed in 2008". The columns (5-6) of Table 8 show the results a discrete specification where we replace the variable $Binding$ by dummies for specific distance between the wage and the sectorial collective agreement floor. The second specification serves to study non-linear effects.

The first two rows of column 3 in Table 8 show the estimates of $SigningYear2008$ and the interaction of $Binding$ and $SigningYear2008$. The main effect is .043, suggesting that workers covered by a collective contracts signed in 2008 and whose wage is exactly that in the collective agreement are 4.3 percent more likely to transit into unemployment in 2009. The negative employment effect of signing in 2008 is mitigated as the 2007 wage is further away from the sectorial minimum, the interaction $SigningYear2008*Binding$ is -.0028. A clearer sense of the magnitude of the impact

is given in column 5 of Table 8. The main effect of having signed in 2008 is -.0423. Nevertheless, for workers with wages between 300 and 1,000 euro above the sectorial minimum, the impact is 1.7 percent (.043-.026=.017), much smaller. Finally, for workers earning a wage 1,000 euro above the sector-province low, the impact of having signed the contract in 2008 on employment losses is below 1 percent, much lower the previous estimates (.043-.034=.009)

Table 9 presents the results of the impact of binding wages on employment destruction controlling for regional-industry fixed effects. The results are similar to the ones commented before and we do not comment them in detail.

6   Robustness checks

6.1   Women and temporary workers

Table 10 presents the results of a series of regressions for the main sample of women. The first specification (first four columns) control for industry and province fixed effects. The second model (last four columns) include region-industry dummies. The results show basically no impacts on employment losses among females. Nevertheless, when we examine job losses over the 2009-2010 horizon, we also find an effect of signature on 2008 on job loss of unskilled females.

6.2   Newly hired workers

The subsample with information about the nominal collective agreement wage levels does not incorporate information about the extra complements bargain in the collective contracts, it just include information about the basis nominal collective agreement wage level. Therefore, we expect the nominal collective agreements wage levels of the sample to be more relevant for this group (given that they have not acquired much complements for tenure). We defined newly hired workers as those who have been hired in the previous two year to 2009 and have been employed during all 2008. Table 3 gives some descriptives about this new sample. The main differences are the age of the workers (the newly hired are younger, 31 vs 36 on average) and the type of contract (25% of newly hired are covered by fixed-term contracts in comparison to 12 % in the other sample).

The results in Table 11 are very similar to those in Table 8, and we do not comment them in detail.

7 Conclusions

We present evidence for Spain during the Great Recession suggesting that both bargained wage growth and employment-to-unemployment transitions depend on the information available at the time when collective agreement were signed . The degree of widespread downward wage rigidity induced by automatic extension of provincial agreements and multi-period bargaining implies that only collective contracts signed after agents could observe large drops in aggregate activity and employment could partially adjust by reducing wage growth to 1.5%. However, firms covered by collective agreements already signed before 2009 faced a sharp drop in activity while experiencing increases in labor costs of about 3%. We combine information on the exact dates of collective agreements bargaining periods and longitudinal Social Security worker records to test if higher wage growth during a recession leads to higher flows from employment to unemployment.

An unconditional analysis show that the higher wage growth due to wage rigidity increased the transitions into unemployment mostly for the least skilled workers. For that group, we estimate an elasticity of the probability of losing the job to wage growth of 3. The job loss response to higher wage growth may be the result of very low skilled workers being different than the rest of workers or could also be related with the fact that the collective agreement wages are more binding for this group. To disentangle between both hypotheses, we use a subsample with information on the collective agreement wage level as of 2007 (prior to the recession), and show that wage growth affects the probability of transitions from employment to unemployment for all the groups once we condition on how binding the collective agreement is. Using IV regression models linking the probability of transition from employment to unemployment to agreed wage increases using as instrument the date of signature we show that the impact of the wage rigidity created by the automatic extension of the provincial collective agreements on employment growth explains around a 36% of the increase in the probability of being unemployed for the individuals in the group with lowest skill. Similar estimates for the full sample suggests that had the collective

22

agreements signed a wage increase in 2008 similar to that in 2009, transitions into unemployment in the full sample would have been 5% lower.

The evidence is relevant for policy debate. It suggests that the particular form of wage rigidity created for the automatic extension of provincial agreements and multiperiod bargaining had a role on the employment destruction during the 2008-2009 recession in Spain. However, further research must assess how important this source of wage rigidity was during other recessions. Furthermore, the role of downward wage rigidity on job creation is a key to assess the future implications of latter labor reforms in Spain and, more generally, to understand how the labor market reacts to downward wage rigidity. These topics are left for further research.

8 References (incomplete)

Altonji, Joseph G. and Paul J. Devereux (1999): "The Extent and Consequences of Downward Nominal Wage Rigidity" NBER Working Paper No. w7236

Bentolila, Samuel and Juan J. Dolado (1994): "Labour Flexibility and Wages: Lessons from Spain" Economic Policy, 18, 54-99

Bentolila, Samuel Mario Izquierdo and Juan F. Jimeno (2010): "Negociación colectiva: La gran reforma pendiente" Papeles de Economía Española 124

Cahuc, Pierre and Andre Zylberberg (2004): Labor Economics. Cambridge: The MIT Press

Calmforms, Lars and John Drifill, (1988): "Bargaining structure, corporatism and macroeconomic performance" Economic Policy, 3, 13-61

Card, David (1990) "Unexpected inflation, real wages, and employment determination in union contracts" American Economic Review, September, Vol.80, No. 4: 669-688

Card, David, and Sara de la Rica (2006): "Firm-level contracting and the structure of wages in Spain" Industrial and Labor Relations Review, Vol.59, No.4 (July)

De la Roca, Jorge (2008): "Real wages and business cycles: Evidence from Spain using Social Security data" Master's Thesis (CEMFI)

Izquierdo, Mario, Esther Moral, and Alberto Urtasun (2003): "Collective bargaining in Spain: An individual data analysis" Bank of Spain Occasional Discussion Paper #0302. Madrid: Bank of Spain

Jimeno, Juan F. and Carlos Thomas (2011): "Collective Bargaining, Firm Heterogeneity and Unemployment" Bank of Spain Working Paper No. 1131

Lacuesta, Aitor, Sergio Puente and Ernesto Villanueva (2012): "The schooling response to a sustained increase in low-skill wages: Evidence from Spain 1989-2009" Working Paper n1208, Bank of Spain

Layard, Richard, Stephen Nickel and Richard Jackman (1991): Unemployment: Macroeconomic Performance and the Labour Market. Oxford University Press

Olivei, Giovanni and Silvana Tenreyro (2007): "The timing of monetary policy shocks" American Economic Review, June, Vol. 97, No. 3: 636-663

Olivei, Giovanni and Silvana Tenreyro (2010) "Wage setting patterns and monetary policy: International evidence" Journal of Monetary Economics, Volume 57, Issue 7, October. Pages 785-802

Figure 1: Example of a collective agreement

TABLA DE RETRIBUCIONES BRUTAS DEL CONVENIO DE LA CONSTRUCCIÓN Y OBRAS PÚBLICAS DE NAVARRA

Revisión salarial. Efectos: 1-1-2010 a 31-12-2010. Incremento: 4,5%

NIVELES	SALARIO BASE	COMPL. CONVENIO	PLUS EXTRASAL.	TOTAL MES	JULIO	NAVIDAD	VACACIONES	TOTAL ANUAL
II Titulado Superior	2.102,35	555,97	65,54	2.723,86	3.467,27	3.467,27	3.467,27	40.364,27
III Titulado Medio	1.725,24	467,14	65,54	2.257,92	2.873,88	2.873,88	2.873,88	33.458,76
IV Encargado General	1.670,51	453,53	65,54	2.189,58	2.795,09	2.795,09	2.795,09	32.470,65
V Jefe Admon. 2.ª	1.498,57	410,43	65,54	1.974,54	2.519,81	2.519,81	2.519,81	29.279,37
VI Delineante 1.ª	1.285,55	357,97	65,54	1.709,06	2.179,21	2.179,21	2.179,21	25.337,29
VII Capataz	1.262,40	355,72	65,54	1.683,66	2.144,91	2.144,91	2.144,91	24.954,99
VIII Oficial 1.ª	1.234,36	358,33	65,54	1.658,23	2.110,66	2.110,66	2.110,66	24.572,51
IX Oficial 2.ª	1.085,89	326,52	65,54	1.477,95	1.878,53	1.878,53	1.878,53	21.893,04
X Especialista	1.022,26	315,92	65,54	1.403,72	1.782,02	1.782,02	1.782,02	20.786,98
XI Peón Especializado	1.004,83	317,78	65,54	1.388,15	1.760,69	1.760,69	1.760,69	20.551,72
XII Peón Ordinario	969,67	313,00	65,54	1.348,21	1.708,38	1.708,38	1.708,38	19.955,45
XIII Aspirante Admon.	689,31	222,80	65,54	977,65	1.239,23	1.239,23	1.239,23	14.471,84
XIV Aprendices:								
De 16 y 17 años: 1.er año	597,24	179,58	65,54	842,36	1.033,19	1.033,19	1.033,19	12.365,53
De 16 y 17 años: 2.º año	651,53	195,91	65,54	912,98	1.127,12	1.127,12	1.127,12	13.424,14
De 18 a 21 años: 1.er año	705,83	212,24	65,54	983,61	1.221,05	1.221,05	1.221,05	14.482,86
De 18 a 21 años: 2.º año	760,12	228,56	65,54	1.054,22	1.314,97	1.314,97	1.314,97	15.541,33

Figure 2: Destruction of employment in Spain during the 2009-2010 recession
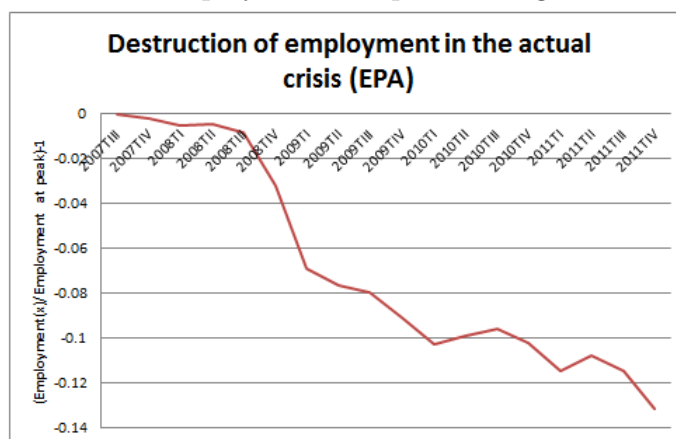
This graph shows the evolution of the destruction of employment in Spain during the 2008-2009 recession. It presents the percentage decrease in employment by quarter taking as reference point the peak at the third quarter of 2007.
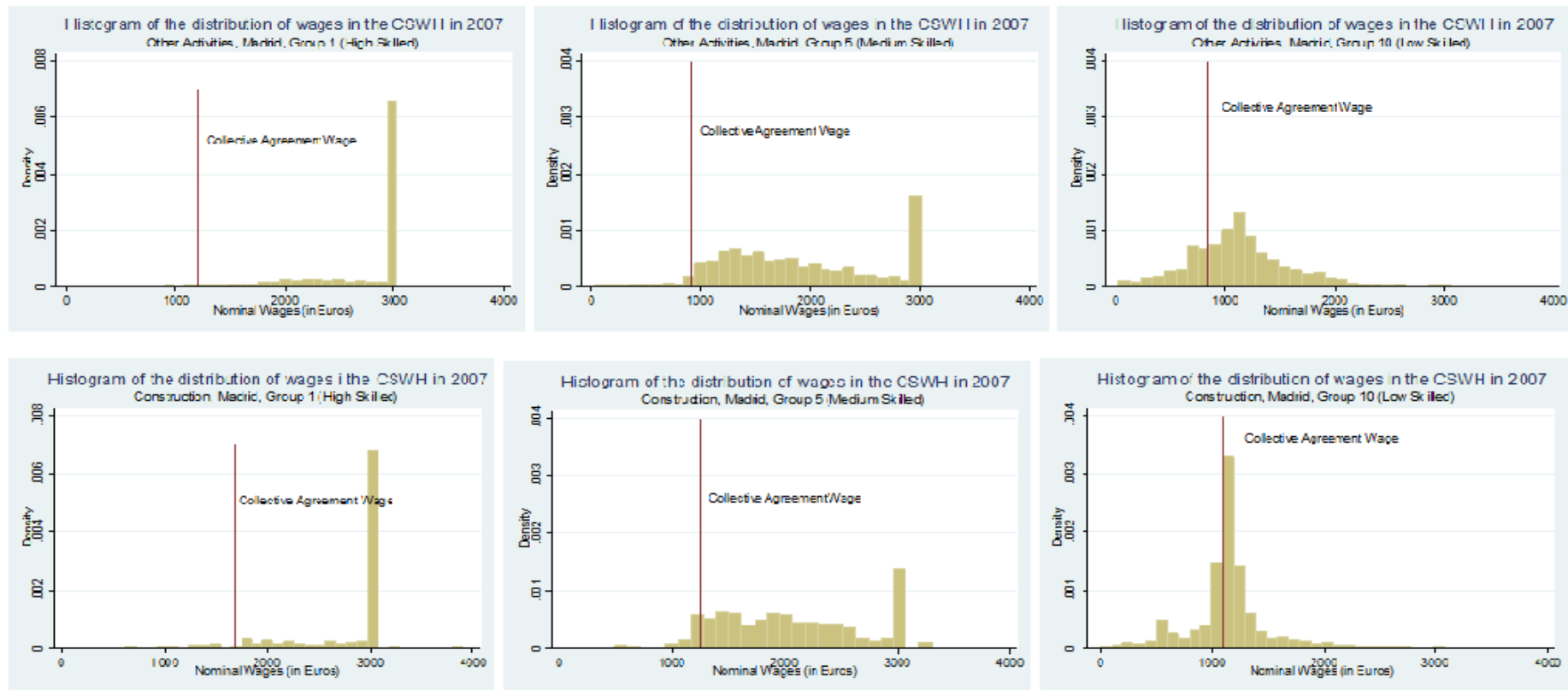
Figure 3: How binding collective agreements are? An example

Sample: Social Security records (Continuous Sample of Working Histories)

The figure presents the distribution of nominal wages for the construction and service to industries sectors in Madrid for three groups:
 low-skill (group 10), mid-skill (group 5) and high -skill (group 1) for workers hired on or after 2007.

Figure 4: Evolution of the predicted agreed wage increase by year of signature
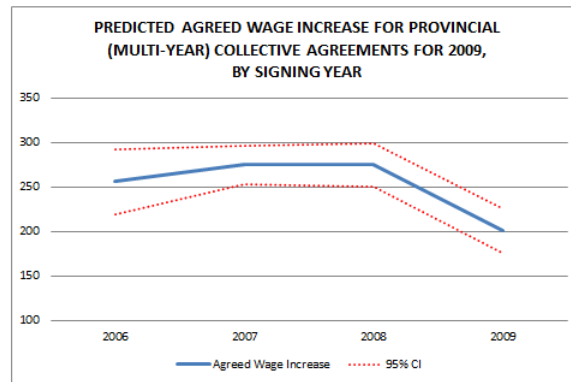
PREDICTED AGREED WAGE INCREASE FOR PROVINCIAL (MULTI-YEAR) COLLECTIVE AGREEMENTS FOR 2009, BY SIGNING YEAR

*Predicted agreed wage increase for provincial collective agreements using a regression weighted by number of workers and controlling for province and 3digit industry fixed effects, length of collective agreement and escalation clause. Robust standard errors cluster at province and 3digit industry level.

Figure 5: Evolution of the predicted agreed wage increase by quarter of signature
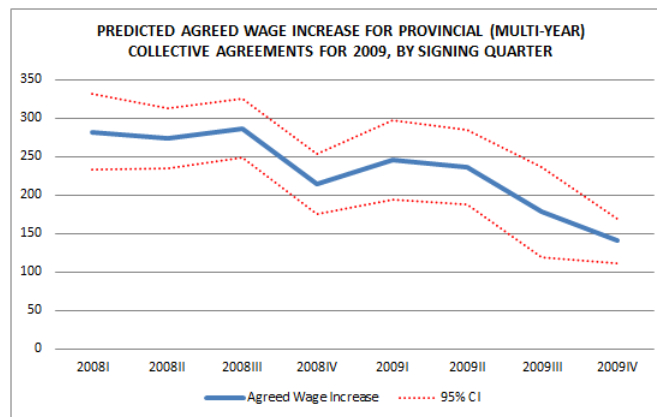
PREDICTED AGREED WAGE INCREASE FOR PROVINCIAL (MULTI-YEAR) COLLECTIVE AGREEMENTS FOR 2009, BY SIGNING QUARTER

*Predicted agreed wage increase for provincial collective agreements using a regression weighted by number of workers and controlling for province and 3digit industry fixed effects, length of collective agreement and escalation clause. Robust standard errors cluster at province and 3digit industry level.

Figure 6: Evolution of the predicted probability of being unemployed by quarter of signature

*Predicted probability of unemployed in 2010 for men in provincial collective agreements for 2009 using a regression weighted by number of workers and controlling for province and 3digit industry fixed effects, age, skills, type of contract, length of agreement and escalation clause. Robust standard errors cluster at province and 3digit industry level.

Table 1: Descriptive Statistics - Full Sample

FINAL SAMPLE - MEN

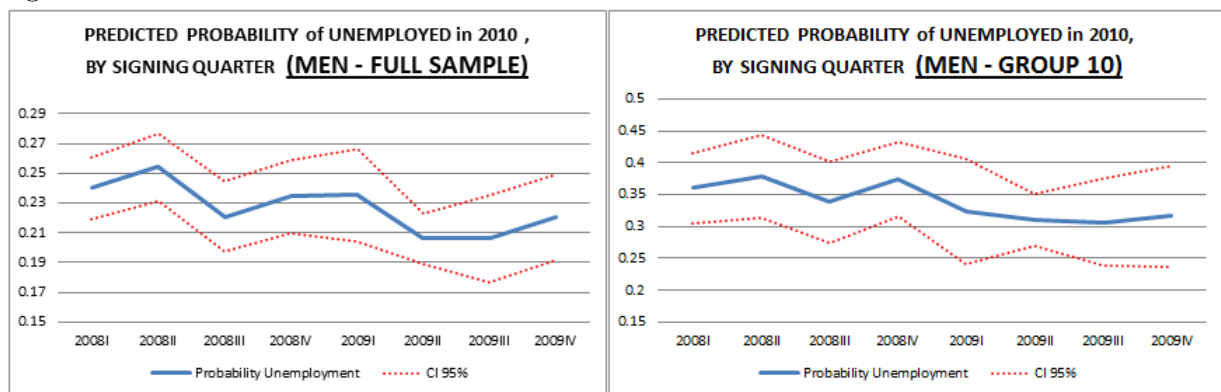|	Full Sample	SigningYear2008	SigningYear2009
Agreed wage increase (MEAN)	202.60	294.45	124.95
Agreed wage increase (SD)	152.82	101.54	145.66
Agreed wage increase (MEDIAN)	230	300	50
Age (MEAN)	38.47	38.55	38.4
Age (SD)	9.70	9.73	9.68
High Skilled (groups 1, 2 and 3) (%)	17.74	15.28	19.82
Medium Skilled (groups 4, 5, 6 and 7) (%)	22.78	20.72	24.53
Low Skilled (groups 8, 9 and 10) (%)	59.48	64	55.65
Open-ended contracts (%)	86.8	85.52	87.87
Fixed-term contracts (%)	13.2	14.48	12.13
Observations	46291	21208	25083

Table 2: Descriptive Statistics - Binding Sample

BINDING

	Full Sample	SigningYear2008	SigningYear2009
Agreed wage increase (MEAN)	192.56	306.12	109.16
Agreed wage increase (SD)	155.11	80.93	143.16
Agreed wage increase (MEDIAN)	240	350	60
Age (MEAN)	36.97	36.77	37.11
Age (SD)	9.64	9.83	9.50
High Skilled (groups 1, 2 and 3) (%)	34.54	27.84	39.45
Medium Skilled (groups 4, 5, 6 and 7) (%)	38.49	38.08	38.79
Low Skilled (groups 8, 9 and 10) (%)	26.97	34.08	21.75
Open-ended contracts (%)	87.7	84.49	90.08
Fixed-term contracts (%)	12.3	15.51	9.92
Observations	10748	4551	6197

Table 3: Descriptive Statistics - Binding Sample (Newly hired)

BINDING - NEWLY HIRED

	Full Sample	SigningYear2008	SigningYear2009
Agreed wage increase (MEAN)	196.50	310.70	118.71
Agreed wage increase (SD)	158.15	76.37	152.14
Agreed wage increase (MEDIAN)	240	350	60
Age (MEAN)	31.48	31.58	31.41
Age (SD)	9.24	9.68	8.93
High Skilled (groups 1, 2 and 3) (%)	35.13	27.25	40.50
Medium Skilled (groups 4, 5, 6 and 7) (%)	30.9	30.38	31.26
Low Skilled (groups 8, 9 and 10) (%)	33.97	42.37	28.24
Open-ended contracts (%)	74.8	68.84	78.77
Fixed-term contracts (%)	25.3	31.16	21.23
Observations	1893	767	1126

Table 4: First Stage

DEPENDENT VARIABLE	(1) Agreed Wage Increase
SigningYear2010	-155.5***
	(13.07)
SigningYear2009	-108.6***
	(9.641)
SigningYear2008	-28.67***
	(8.224)
SigningYear2006	-50.56***
	(14.59)
Province FE	Yes
Industry FE	Yes
Observations	772
F-test	952.74
R-squared	0.614

Source: Registry of Collective Agreements. The table shows OLS with fixed effects coefficients of the regression:

$$\Delta \text{AgreedWage}_{2009sp} = \sum_{j=2006}^{2010} \alpha_j \mathbf{1}(\text{Ysign}_{jsp}) + \gamma X_{sp} + \eta_s + \sigma_p + \epsilon_{sp} \quad (7)$$

where the dependent variable is the agreed wage increase for collective agreements with economic effect in 2009. Ysign is the year when the collective contract was signed. X_{sp} collects other covariates such as the length of the contract, whether is the first collective agreement or not and whether it has an escalation clause or not. η_s and σ_p are sectorial and provincial fixed effects, that capture industry-specific and region shocks, respectively. The regression is weighted by the union's estimate of the number of workers covered by the agreeement.

Table 5: OLS estimates of the effects of year of signature on transitions to unemployment

Unempl. in	2009	+2010	2009	+2010	2009	+2010	2009	+2010
Sample:	All		Low skilled		All		Low skilled	
Signed 2008	.0043	.0097	.0317**	.0318**	-.0016	.0086	.0492*	.057**
	(.0044)	(.0061)	(.0125)	(.0145)	(.0052)	(.0078)	(.027)	(.029)
Age<30	.0326	.053	.063	.098	.032	.0528	.071	.104
	(.0057)	(.0082)	(.013)	(.016)	(.0057)	(.0082)	(.014)	(.0169)
Age30-35	.0069	.0199	.0210	.064	.0066	0.019	.028	.067
	(.0042)	(.006)	(.016)	(.019)	(.0043)	(.006)	(.017)	(.020)
Age36-40	-.0009	-.0003	.0054	.0092	-.001	-.0005	.011	.01
	(.004)	(.0062)	(.016)	(.018)	(.005)	(.0062)	(.017)	(.018)
Age45-50	-.0038	-.00035	.0324	.035	-.0041	-.001	.039	.031
	(.0045)	(.0056)	(.0220)	(.024)	(.0045)	(.006)	(.024)	(.025)
Age>50	.004	.02	.014	.029	.0043	.02	.020	.037
	(.004)	(.006)	(.021)	(.023)	(.0045)	(.006)	(.023)	(.0247)
Low-skill	.0405	.057			.040	.056		
	(.00507)	(.007)			(.0052)	(.007)		
High-skill	-.015	-0.0252			-0.0151	-0.0254		
	(.006)	(0.00785)			(0.00603)	(0.00799)		
Fixed-term	.158	.207	.182	.216	.158	0.21	.19	0.22
	(.013)	(.013)	(.015)	(.019)	(.013)	(.013)	(.015)	(0.02)
Province FE	yes	yes	yes	yes	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes	yes	yes	yes	yes
Region-year FE	no	no	no	no	yes	yes	yes	yes
Observations	46,291		5,078		46,249		5,070	
R-squared	0.085	0.118	0.152	0.196	0.091	0.125	0.175	0.221

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Registry of Collective Agreements and CSWH 2010, sample of men. The table shows OLS estimates of the regression:

$$P[U_i(2009)|E_i(2008)] = 1(signed2008) + X_{spi} + \mu_s + \sigma_p + \varepsilon_{spi}$$

The dependent variable takes value 1 if the individual lost his job during 2009-2010. Signed 2008 is a dummy that takes value one if the collective contract was signed in 2008. X_{spi} collects individual characteristics like fixed-term contract, five age dummies, skill level and collective agreement characteristics - the length of the contract, whether is the first collective agreement and whether it has an escalation clause or not. μ_s and σ_p are sectorial and provincial fixed effects. Standard errors clustered at the 3digit industry-province level.

Table 6A: The response of job loss to wage increases, full sample of males.

Dependent variable:	First stage (1) Wage Increase	Intention to treat (2) $P(U_{2009})$	(3) $P(U_{2009-2010})$	Two Stage Least Squares (4) $P(U_{2009})$	(5) $P(U_{2009-2010})$
Estimation method	OLS	OLS	OLS	TSLS	TSLS
1. Signed 2008	1.31***	.00430	0.00973		
	(.157)	(.00436)	(0.00611)		
2. Wage Increase				.00328	.00742
(agreed)				(.0034)	(.00491)
Province Fixed Effects	yes	yes	yes	yes	yes
Industry Fixed Effects	yes	yes	yes	yes	yes
Region*industry	no	no	no	no	no
Observations	46,291	46,291	46,291	46,291	46,291
R-squared	0.712	0.085	0.118	0.085	0.117

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Registry of Collective Agreements and CSWH 2010.Sample of males. The First Stage is estimated by OLS using the number of workers in Social Security sample as implicit weights. Wage increases measured in percentage points.

$$AgreedWage2009 = \alpha_0 + \alpha_1 1(SigningYear2008sp) + X_{spi} + \mu_s + \sigma_p + \varepsilon_{spi}$$

The Intention to Treat model regresses $P(U_{2009})$, a shorthand for the probability of job loss $P(U2009_{spi}|E2008)$, on the same set of covariates

$$P(U2009_{spi}|E2008) = \beta_0 + \beta_1 1(signed2008sp) + X_{spi} + \mu_s + \sigma_p + \varepsilon_{spi}$$

The main regression is an IV model of the probability of transition from employment to unemployment as a function of the agreed wage increase, instrumenting the latter with the date of signature. Signed2008 is a dummy that takes value of one if the collective contract was signed in 2008. X_{spi} collects other covariates such as individual characteristics like type of contract (fixed-term contract), five age dummies, skill level, and collective agreement characteristics such as the length of the contract, whether is the first collective agreement or not and whether it has an escalation clause or not. μ_s and σ_p are 3-digit industry and provincial fixed effects. Standard errors are clustered at the province-industry-level.

Table 6B: The response of job loss to wage increases, full sample males.

Dependent variable:	(6) Wage Increase	(7) $P(U_{2009})$	(8) $P(U_{2009-2010})$	(9) $P(U_{2009})$	$P(U_{2009-2010})$
Estimation method	WLS	OLS	OLS	TSLS	TSLS
1. Signed 2008	1.353***	-.00159	.0086		
	(.187)	(.00521)	(.0077)		
2. Wage Increase				-.0016	.00626
(agreed)				(.0040)	(.0059)
Province Fixed Effects	yes	yes	yes	yes	yes
Industry Fixed Effects	yes	yes	yes	yes	yes
Region*industry	yes	yes	yes	yes	yes
Observations	46,249	46,249	46,249	46,249	46,249
R-squared	0.938	0.091	0.125	0.090	0.124

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7A: The response of job loss to wage increases, low skilled males.

Dependent variable:	(1) First stage Wage Increase	(2) Intention-to-treat $P(U_{2009})$	(3) $P(U_{2009-10})$	(4) Two-Stage Least Squares $P(U_{2009})$	(5) $P(U_{2009-10})$
Estimation method:	WLS	OLS		TSLS	
1. Signed 2008	1.22***	.0317**	.0318**		
	(.0181)	(.0125)	(.0145)		
2.Wage Increase				.0259**	.0259*
(agreed)				(.0118)	(.0134)
Fixed Effects province	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes
Region*industry FE	no	no	no	no	no
Observations	5,078	5,078	5,078	5,078	5,078
R-squared	0.755	0.152	0.196	0.147	0.191

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Registry of Collective Agreements and CSWH 2010.Sample of low skilled males. The table shows IV with fixed effects coeficients of thefollowing regressions:

First Stage: The dependent variable is the wage increase, measured in percentage points.

$$AgreedWage2009 = \alpha_0 + \alpha_1 1(signed2008_{sp}) + X_{spi} + \mu_s + \sigma_p + \varepsilon_{spi}$$

Intention to Treat estimates are obtained from OLS estimates of the form

$$P(U2009_{spi}|E2008) = \beta_0 + \beta_1 1(signed2008_{sp}) + X_{spi} + \mu_s + \sigma_p + \varepsilon_{spi}$$

The main regression is an IV model of the probability of job loss on agreed wage increase using the date of signature as instrument. Signed2008 is a dummy that takes value of one if the collective contract was signed in 2008. X_{spi} collects other covariates such as individual characteristics like type of contract (whether fixed-term contract), five age dummies, skill level and collective agreement characteristics such as the length of the contract, whether is the first collective agreement and whether it has an escalation clause. μ_s and σ_p are 3-digit industry and provincial fixed effects. Standard errors are clustered at the province-industry-level.

Table 7B: The response of job loss to wage increases, low skilled males.

Dependent variable:	(6) First stage Wage Increase	(7) $P(U_{2009})$	(8) $P(U_{2009-2010})$	(9) $P(U_{2009})$	(10) $P(U_{2009-2010})$
		Intention-to-treat		Two Stage Least Squares	
Estimation method:	WLS	OLS		TSLS	
1. Signed 2008	.954***	.0492*	.0574**		
	(.020)	(.0267)	(.0289)		
2. Wage Increase				.0516	.0602*
(agreed)				(.0318)	(.0341)
Fixed Effects province	yes	yes	yes	yes	yes
Industry fixed effects	yes	yes	yes	yes	yes
Region*industry FE	yes	yes	yes	yes	yes
Observations	5,070	5,070	5,070	5,070	5,070
R-squared	0.950	0.175	0.221	0.171	0.219

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Job loss responses to signature date, by distance between wage and sectoral floor.

Prob. Unemployment	No interactions		Continous		Discrete	
	(1)	(2)	(3)	(4)	(5)	(6)
	2009	2009-2010	2009	2009-2010	2009	2009-2010
1. Signed 2008	.0243***	.0388***	.0431***	.0536***	.0423***	.0468***
	(.00914)	(.0109)	(.0119)	(.0150)	(.0145)	(.0169)
2. Binding*Signed 2008			-.0028**	-.00235		
			(.0012)	(.0015)		
3. Binding			-.00148**	-.00374***		
			(.00063)	(.00072)		
4. (300<Binding<1,000 euros) *Signed 2008					-.0257	-.0094
					(.0193)	(.023)
5. (Binding>1,000 euros)* Signed 2008					-.0339**	-.0214
					(.017)	(.0237)
6. (300<Binding<1,000 euros)					-.0402***	-.0677***
					(.0152)	(.0177)
7. (Binding>1,000 euros)					-.0429***	-.0807***
					(.011)	(.0121)
Province + Industry F.E.			yes			
Region* Industry fixed effects			no			
Observations	10,748	10,748	10,748	10,748	10,748	10,748
R-squared	0.126	0.167	0.128	0.171	0.130	0.173

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Registry of Collective Agreements and CSWH 2010. Sample of men with information on collectively bargained wage levels. The information includes five industries only: Construction, Metal, Retail Trade, Accommodation and Food Service and Other Services and seven groups of the Spanish Social Security System: 1, 2, 3 (High Skilled), 4, 5, 6 (Medium Skilled) and 10 (Low Skilled).

Binding = Nominal wage individual - Collective Agreement Wage (within industry, province and group of skill).

Model in columns 1-4:

$$P(U2009_{spi}|E2008_{spi})= \delta_0+\delta_1 1(signed2008_{sp}) + \delta_1 1(signed2008_{sp}) * Binding$$
$$+\delta_2 Binding + X_{spi}+\mu_s+\sigma_p+\varepsilon_{spi}$$

The dependent variable takes value 1 if the the individual transits from employment into unemployment in 2009 (or 2010) conditional to be employed in 2008. Signed2008 is a dummy that takes value of one if the collective contract was signed in 2008. Standard errors clustered at the province-3 digit industry level. See notes to tables 5-7.

Table 9: Job loss responses to signature date, by distance between wage and sectoral floor.

Prob. Unemployment	No interactions		Continous		Discrete	
	(1)	(2)	(3)	(4)		
	2009	2009-2010	2009	2009-2010	2009	2009-2010
1.Signed2008	.0183	.0463**	.0378*	.0620**	.0347	.0515*
	(.0206)	(.0220)	(.0218)	(.0239)	(.0242)	(.0267)
2.Binding*Signed2008			-.0030**	-0.00247		
			(.0012)	(0.00164)		
3.Binding			-.0013*	-.0037***		
			(.00067)	(.0007)		
4.(300<Binding<1,000 euros)					-.0264	-.0081
*Signed2008					(.0197)	(.024)
5.(Binding>1,000 euros)					-.0369**	-.0231
*Signed2008					(.0177)	(.0253)
6.(300<Binding<1,000 euros)					-.0390**	-.067***
					(.0155)	(.0181)
7.(Binding>1,000 euros)					-.0412***	-.081***
					(.0115)	(.0127)
Province and Industry fixed effects				yes		
Region*Industry fixed effects				yes		
Observations	10,748	10,748	10,748	10,748	10,748	10,748
R-squared	0.132	0.174	0.134	0.178	0.136	0.180

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

See notes to Table 8.

Table 10. The response of job loss to date of signature, females.

	Whole Sample		Group 10	
	(1)	(2)	(3)	(4)
	Prob. Unem. 2009	Prob. Unem. 2010	Prob. Unem. 2009	Prob. Unem. 2010
Signed 2008	-.0036	-.0041	.012	.0282**
	(.0030)	(.0046)	(.013)	(.0137)
Observations	38,749	38,749	5,801	5,801
R-squared	0.042	0.061	0.082	0.104

Robust standard errors in parentheses

Controlling for age, skills, type of contract, length of collective agreement and escalation clause

Table 11: Job loss responses to signature date, by distance between wage and sectoral floor. Sample of newly hired males

Prob. Unemployment	No interactions		Continous		Discrete	
	(1)	(2)	(3)	(4)		
	2009	2009-2010	2009	2009-2010	2009	2009-2010
1. Signed2008	.0235	.0380	.0473**	.0805***	.0596**	.0653**
	(.0187)	(.0232)	(.0236)	(.0306)	(.0262)	(.0299)
2. Binding*Signed2008			-0.00416	-.00738**		
			(.00271)	(.00313)		
3. Binding			-.000781	-.00088		
			(.00158)	(.002)		
4. (300<Binding<1,000 euros) *Signed 2008					-.0809**	-.0183
					(.0403)	(.0439)
5. (Binding>1,000 euros) *Signed 2008					-.0497	-.0951**
					(.0429)	(.0462)
6. (300<Binding<1,000 euros)					-.0117	-.0313
					(.0251)	(.0250)
7. (Binding>1,000 euros)					-.0207	-.0285
					(.0193)	(.0262)
Province and industry fixed-effects				yes		
Region*Industry fixed effects				no		
Observations	1,893	1,893	1,893	1,893	1,893	1,893
R-squared	0.174	0.219	0.176	0.223	0.178	0.223

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1